



INTERNATIONAL JOURNAL OF
MODERN EDUCATION
(IJMOE)
www.ijmoe.com



COLLABORATIVE PRACTISE AS THE INTERSECTION BETWEEN DIGITAL LEARNING AGILITY AND TEACHERS' PROFESSIONAL DEVELOPMENT

Mas Nida Md Khambari^{1*}, Nur Dania Mohd Rosli,¹ Kamilah Abdullah¹, Su Luan Wong¹, Noor Syamilah Zakaria², Priscilla Moses³, Nur Aira Abdrahim⁴

- ¹ Department of Science and Technical Education, Universiti Putra Malaysia, Malaysia
Email: daniarozie@gmail.com, khamasnida@upm.edu.my, kamilahabdullah@gmail.com, suluan@upm.edu.my
- ² Department of Counselor Education and Counseling Psychology, Universiti Putra Malaysia, Malaysia
Email: syamilah@upm.edu.my
- ³ Department of General Studies, Universiti Tunku Abdul Rahman, Malaysia
Email: priscilla@utar.edu.my
- ⁴ Department of Professional Development and Continuing Education, Universiti Putra Malaysia, Malaysia
Email: nuraira@upm.edu.my
- * Corresponding Author

Article Info:

Article history:

Received date: 29.01.2025
Revised date: 12.02.2025
Accepted date: 17.03.2025
Published date: 30.03.2025

To cite this document:

Khambari, M. N. M., Rosli, N. D. M., Abdullah, K., Su, L. W., Zakaria, N. S., Moses, P., & Abdrahim, N. A. (2025). Collaborative Practise As The Intersection Between Digital Learning Agility And Teachers' Professional Development. *International Journal of Modern Education*, 7 (24), 1264-1275.

DOI: 10.35631/IJMOE.724089

Abstract:

The volatile, uncertain, complex, and ambiguous (VUCA) world and IR4.0 developments forces drastic changes to sustain and provide quality education. When schools were shut down abruptly due to COVID-19, teachers were forced into emergency remote teaching, mostly by utilising technologies but with little to no specific structure. However, teachers who are digitally agile could maneuver the unprecedented situation. This study therefore explores the role of collaborative practise as the intersection between digital learning agility and teachers' professional. A qualitative case study approach was employed, involving semi-structured interviews with 20 primary and secondary school teachers, and five school administrators over the course of two months. Data were analysed using thematic analysis to identify key patterns and insights related to collaborative practices as a component of digital learning agility and teachers' professional development. Three main themes that emerged from the analysis were (i) acquisition of new skills and knowledge, (ii) peer support, mentorship and resource sharing, and (iii) innovation, reflection and institutional growth. This highlights the necessity for organised and supportive collaborative settings that enable educators to explore and implement digital technologies, so that it could enhance both the personal and institutional efficacy. The challenges posed by the pandemic, the exponential use of ICT during the time and active collaboration among teachers has contributed to their professional development.

This work is licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)

**Keywords:**

Collaborative Practices, Professional Development, Digital Learning Agility, Teachers, Qualitative Case Study

Introduction

Technology ability is a growing challenge among teachers in Malaysia when education was threatened by COVID-19. This is due to their limited experience in preparing electronic materials and using online platforms prior to the pandemic (Chin, Jiew & Al Jupri, 2022). Their inability to respond quickly to the drastic changes in online learning has caused learning delays, and to some extent, learning loss (Moscoviz & Evans, 2022). However, these can be mitigated if teachers are agile, despite their scarce technological knowledge. Agile teachers are willing to face a new experience with flexibility and speed because they know that students' learning are hinged by the teachers' competence (Pamon & Oco, 2024; Liu et al., 2022). For instance, teachers are willing to try new practices and make quick adjustments so that learning can be realized even when they do not know exactly what to do when they face unexpected challenges.

As the frontrunners of education, the teacher's role is paramount in ensuring the sustainability and quality of education. Moreover, with the emergence of the Digital Education Policy, their roles as a strategic classroom leader became more apparent in ensuring the feasibility of the policy. With the challenges presented by VUCA and the rapid developments of IR4.0, teaching and learning is facing an unexpected transformation not only through methods and techniques, but steep growth of teachers' mindsets, instructional practices and knowledge orientation. Galés and Gallon (2019) asserted that the growing needs for a dynamic and flexible learning for every child necessitates a much more complex and enriched principles for teaching and learning, which consequently requires upskilling and reskilling among teachers. These resonate the aim of Malaysian Teacher Standard 2.0 (MTS 2.0) whereby teachers should be able to self-initiate their own professional development (Ministry of Education, 2019) to move forward. However, no structure is available for the teachers to refer to in order to embark on this path.

Two of the main domains in MTS 2.0, namely Instructional and Knowledge Orientation, highlight on teachers' competence in (i) planning and implementing teaching and learning, and (ii) understanding and broadening knowledge in teaching and learning, specifically in mastering pedagogical content knowledge. Ironically, technological knowledge was not mentioned, although it is one of the knowledge areas that is deemed important for teachers to acquire (Koehler & Mishra, 2009). According to MTS 2.0, the soul of an educator refers to the fundamental beliefs that shape a teacher's thoughts and practices. However, how do MTS 2.0 help shape teachers when one of the most important knowledge areas is missing from the framework? Even if it is there, teachers' response speed to the VUCA circumstances in today's world is not emphasized in MTS 2.0. For instance, a teacher may be able to respond to unexpected situations by making changes in their classroom – but only after six months of familiarizing themselves with technologies. This translates to learning delays and loss. However, an agile teacher who can respond to unexpected situations within a day or two, could curb learning delays and loss threatened by the VUCA circumstances.

In today's dynamic and constantly changing educational environment, the pursuit of novel approaches to enhance teaching practices and expand student learning experiences is a continuous endeavour. A novel concept known as "Digital Learning Agility" which stemmed from the concepts of Learning Agility, is emerging as educators learn how to navigate their tasks in the digital age (Khambari, Wong, Abdullah, Moses, & Hamzah, 2022). This paradigm can inform how teachers use technology, adjust to evolving learning environments, and improve student achievement even though it is mainly unknown or during unprecedented situations.

Literature Review

Learning Agility

Agility is well positioned to respond to uncertainty (Krotov, Junglas & Steel, 2015), thus this trait is much needed in the post-pandemic world and other VUCA circumstances in Malaysia. Galés and Gallon (2019) vouched that an agile approach to teaching and learning in modern environment should be able to offer a flexible but structured situation that is ambidextrous to meet the growing needs of both teachers and students. Rutkiene and Ponomarenko (2019) emphasize the importance of teachers acquiring the ability to use modern digital technologies and equipment for information searching and lesson preparation. These contribute to their students' information and visual communication culture and systematic development of digital literacy.

While Learning Agility has long been discussed in organizational agility to ensure successful and effective performance (Hoff & Burke, 2017), it was not the case in the educational settings. According to Hoff and Burke (2017), an individual's ability to handle pressure and respond accordingly is an important factor in Learning Agility process. Furthermore, Burke (2018) and Murphy (2021) elaborated on the characteristics of Learning Agility. They vouched that Learning Agility is characterized based on individual's ability for flexibility, speed, experimenting, performance risk-taking, interpersonal risk-taking, collaborating, information gathering, feedback seeking, and reflecting.

Borrowing their views in the Malaysian education context, this study seeks to understand how collaborative practices among teachers as a trait of digital learning agility could support their professional development. Research studies on Learning Agility are usually related to outcome. Outcome can be viewed as organizational outcome and individual outcome (Ghosh, Muduli & Pingle, 2020). DeRue et al. (2012) also account for outcomes in two forms, namely (1) learning in and across situations and (2) positive performance change overtime. To operationalise the aforementioned concept in this study, teachers' collaborative practice is regarded. As one of the traits of digital learning agility that could shape their professional development.

So much so, teachers' Digital Learning Agility is closely related to self-initiated professional development emphasized in MTS2.0. In the same vein, the Malaysian Ministry of Education in their ICT Transformation Plan 2019-2023 aspired that teachers are able to be open and dynamic towards the use of technologies to improve the learning ecosystem (Ministry of Education, 2019). However, it does not specifically focus on flexibility and speed to effectively achieve the aspiration.

Collaborative Practices and Professional Development

Collaborating or collaborative practices is one of DLA's characteristics. According to Sulaiman, Shaifuddin, & Samsudin (2024) on his research on secondary school teachers' experiences, it is crucial to emphasise that incorporating information and communication technology (ICT) into the classroom presents several difficulties for Malaysian educators. Moreover, during the pandemic when the use of technologies for emergency remote teaching increased exponentially, teachers were forced to use ICT without proper training. Designing successful technology integration training programs requires evaluating Malaysian teachers' ICT use and attitudes (Islam, Mok, Gu, Spector, & Hai-Leng, 2019).

Professional Learning Communities (PLCs) have emerged as a vital framework for fostering collaboration and continuous teacher development. A much recent study by Yu and Chao (2023) analysed strategies to enhance active participation in PLCs. They highlighted the significance of fostering environments that promote idea exchange and practice sharing, all of which resonates with collaborative practices. This study is incongruence with Darling-Hammond et al., (2017) who asserted that collaborative settings could promote reflective practices and innovation because it exposes teachers to diverse viewpoints and teaching strategies. These findings underscore the value of collaborative environments in enhancing teachers' reflective teaching practices, encouraging innovation, and improving overall instructional effectiveness.

The evolving landscape of teacher professional development has shifted towards more flexible, collaborative, and self-directed approaches. Thus, the way teachers learn and grow has undergone a paradigm shift (Bergmark, 2020). According to Bergmark (2020), professional development of teachers nowadays is more collaborative in nature and tailored to areas that are identified by the teachers themselves based on their experience and contextual knowledge. Methlagl (2022) further vouched that this collaborative approach is cyclical in nature, not predetermined, and is dependent on the developments of the process. This is in line with Salmerón Aroca et al. (2023) and Richter et al. (2011) who highlighted that professional development can happen formally and informally as it is a continuous process. They continued that knowledge sharing in teacher collaboration activities could enhance teachers' practice. These perspectives reinforce the idea that professional development is an ongoing, dynamic process where collaboration and knowledge sharing play a crucial role in enhancing teaching practices.

Collaboration among teachers has been widely recognized as a key factor in improving teaching effectiveness and student learning experiences. Wang et al. (2023) vouched that collaborative practices that are aimed at consolidating teachers' comprehensive knowledge could benefit students' outcome. They emphasized that such collaboration enables teachers to share diverse pedagogical strategies, refine instructional methods, and address challenges collectively, leading to a more effective and dynamic learning environment. In another study, Milner-Bolotin (2018) emphasised the positive outcomes of collaboration in STEM education, specifically in terms of student engagement, the creation of supportive learning environments, and its influence on educational policy. It emphasized the importance of professional development in enhancing teaching methods and promoting student engagement. These studies collectively highlight the transformative impact of teacher collaboration on both instructional quality and student success across various educational contexts.

Despite the recognized benefits of collaboration in teacher development, its role within the Digital Learning Agility (DLA) framework remains underexplored especially in Malaysia. As teachers navigate rapidly evolving educational technologies, understanding the role of collaborative teacher growth within DLA on their professional development is crucial. Effective collaboration not only enhances pedagogical strategies but also fosters adaptability, reflective practices, and innovation in teaching. By examining the ways in which teachers engage in collaborative learning within DLA, this study aims to uncover its impact on professional growth, knowledge-sharing, and instructional improvement. This study thus focuses to answer this question: How does collaborative teacher growth within the DLA affect professional development?

Methodology

This study employed a qualitative case study approach, as it could provide a broad and in-depth exploration (Creswell & Poth, 2016), specifically teachers' experiences and perceptions regarding collaborative practices as a part of DLA, and how it shapes their professional development. Semi-structured individual interviews were conducted with 25 participants, with ten of them were teachers from primary schools, ten participants were teachers from secondary schools, five participants were school administrators from the selected primary and secondary schools who were willing to participate. Prior to the interview, an interview protocol was developed based on Hoff and Burke's (2017) Digital Learning Agility Framework, specifically focusing on collaborating dimension. The interview protocol was validated by three experts and pilot tested on three participants to ensure its clarity, reliability, and alignment to the research objective.

A purposive sampling method were employed to ensure this study could elicit relevant and meaningful data from participants who have experience in using digital technology in teaching and learning. This is in congruent with Campbell et al. (2020) who advocated that this method could improve rigour and trustworthiness as it matches the participants of the study to the aims of the research. The selection of all 25 participants involved in the study were based on these criteria: (i) they must have at least 5 years of teaching experience, (ii) they must have taught before, during, and after the COVID-19 pandemic, and (iii) they have used digital technologies in teaching and learning. By outlining these criteria, the participants could provide meaningful data that could help achieve the research objective.

Prior to the data collection, ethical approvals have been obtained from the institution's Ethical Board and the Malaysian Ministry of Education. Prior to the interview, all participants were ask to self-assess their perceived digital competency level as a pre-cursor to the interview session. The individual interviews with the participants which utilised the validated interview protocol, lasted for approximately 80 minutes each. They were audio recorded and later transcribed. The interview transcripts were then read and re-read to ensure familiarisation, and they underwent coding and memo-writing for analysis utilising the thematic analysis recommended by Braun and Clarke (2006). During data analysis, similar data were coded and appended with memos by the researchers as a reflexivity practise. This is meant to ensure its relevance to the objective of the study, and its consistency with the theoretical framework and the current literature. This iterative process was done several times among the researchers to reach a consensus so that no important data were left behind. Finally, the codes and memoes

were categorised into themes and they were then compared, contrasted, and integrated with the current literature.

Results and Discussion

Demographic Data

To contextualise the findings of the study, the demographic backgrounds of the participants and their self-assessment of their digital competency are presented in Table 1. The dataset presents the demographic distribution and self-assessed digital competency levels of 25 participants, comprising 10 primary school teachers, 10 secondary school teachers, and five school administrators. In terms of gender distribution, the sample includes eight male participants where three of them were primary school teachers, three were secondary school teachers, and two school administrators at the time of this study. On the other hand, 17 of them are female participants where seven of them primary school teachers, seven were secondary school teachers, and three were school administrators when this study was conducted. Self-assessed digital competency was measured on a scale from 1 (lowest) to 5 (highest). However, no participants rated themselves at levels 1 or 2. Among primary school teachers, four participants rated themselves at level 3, while six of them rated themselves at level 4. Similarly, among the secondary school teachers, three participants rated themselves at level 3, five rated at level 4, and two at level 5, indicating a slightly higher self-perceived digital competency in this group. The findings suggest that the majority of participants perceive themselves to have moderate digital competency, with secondary school teachers demonstrating a slightly higher level of confidence in their digital skills.

Table 1: Participants' Demographic Profile

Category		Number of participants		
		Primary school teachers	Secondary school teachers	School administrators
Gender	Male	3	3	2
	Female	7	7	3
Digital competency level (Self-assessment)	1	–	–	–
	2	–	–	–
	3	4	3	–
	4	6	5	–
	5	–	2	–

The following section shall discuss the thematic findings based on the interview sessions conducted with the participants.

Thematic Findings

Three key themes emerged from the data analysis that answers the question: How does collaborative teacher growth within the DLA affect professional development? They are (i) acquisition of new skills and knowledge, (ii) peer support, mentorship, and resource sharing, and (iii) innovation, reflection, and institutional growth. To protect the anonymity of the participants, pseudonyms are used in the following discussions in adherence to humans-subject safeguarding protocol.

Theme 1: Acquisition of New Skills and Knowledge

From the findings, it was evident that collaboration among teachers helped them acquire new skills and knowledge by exposing them to diverse expertise. This enables skill-building in areas like technology use and innovative teaching strategies. The excerpts from the interview that supported this theme are as follows:

We collaborated with teachers from Sarawak and Sabah ... they wanted us to give a workshop on how to begin TikTok-ing ... I collaborated with teachers from other states.

(Husain, Secondary School Teacher)

When we collaborate, we will learn something new from them, mostly. Maybe I will learn something from them, and then they will learn something from me.

(Zubaidah, Secondary School Teacher)

I joined a workshop conducted by State Education Department ... we recorded our readings, and they would check ... it was interesting.

(Nien, Primary School Teacher)

The above findings aligned with the idea that collaborative professional development could foster reciprocal learning, as vouched by Vangrieken et al. (2015). In addition to that, it confirmed that collaborative practices mirror key aspects of DLA. This include teachers' adaptability, openness to learning new technologies, and their ability to implement digital tools effectively in their classrooms (Wohlfart & Wagner, 2024). Additionally, teachers' engagement and participation in workshops and sharing strategies demonstrated their agility in acquiring and applying their digital competencies.

Theme 2: Peer Support, Mentorship, and Resource Sharing

Another theme that emerged from the findings was peer support, mentorship, and resource sharing. The findings showed that collaborative environments could promote resource sharing and mentorship. Although it was interesting that one of the interview excerpts with a school administrator illustrated a mentorship given by junior teachers to their senior counterparts. This is evident from the interview excerpt below:

For senior teachers...younger teachers help them solve digital-related problems ... [thus] collaboration is important."

(Harun, Primary School Administrator)

Several instances also showed continuous collaboration in online activities among the teachers and its contribution to their professional development.

During the MCO ... I shared some things we could do online for our English Club." (Nien, Primary School Teacher)

The school conducted activities ... [so] we collaborated to collect activities from Facebook, Pinterest, etc."

(Thana, Primary School Teacher)

Sometimes, we overlook certain things, or we're not good at something, but others are better. Collaboration helps improve our professionalism.

(Haida, Primary School Administrator)

One teacher recalled her experience during the pandemic when she taught, she had to work alone. Later, she appreciated the resource sharing experience with her colleagues that had expedited the completion of her work.

When we actually collaborated, we work faster together. I think the part that was most challenging [for me] was when I thought I was alone. In the first month [of the pandemic], I thought that I had to do this alone. My group of friends on WhatsApp were very valuable and really fast ... when my team at school was open about it [challenges of teaching online], the next thing we know we were working together quickly. So when we were in a team, we work quicker.

(Tan, Secondary School Teacher)

Other participants echoed the abovementioned statement, as shown in the following excerpts:

Yes, we separated our tasks when we conduct co-curricular activities so that it will come up well. For example, the division of work include one teacher take introduction part, and I will do other part. We have five teachers so we divide our tasks into five parts.

(Safura, Primary School Teacher)

Our teachers shared their materials by dividing and combining their work so that they can use the teaching materials with their students. They only need to adjust the materials according to their students' ability.

(Jasmi, School Administrator)

All of the findings above are evidences that collaborative practices could promote resource sharing and mentorship. This is critical for addressing skill gaps, particularly when adapting to new challenges like digital learning during the pandemic and beyond. This is particularly important as peer support ensures continuous professional growth through the exchange of ideas and solutions (Zawacki-Richter, Marín, Bond, & Gouverneur, 2019). Additionally, mentorship and resource sharing could enhance DLA by fostering an environment where educators can experiment with and adopt digital tools. To resonate one of the aforementioned findings where senior teachers learned from their junior counterparts, it reflected the fluidity and collaborative spirit needed to stay agile in an exponentially evolving education digital landscape.

Theme 3: Innovation, Reflection, and Institutional Growth

The final theme that emerged from the analysis is innovation, reflection and institutional growth. It was evident that collaborative efforts among teachers could stimulate innovation, encourage reflective practices, and strengthen their institutional performance. Among the excerpts from the interview that resonated this theme include:

Helping others is very good...it not only builds teamwork and relationships, but it can also improve the school's performance.
(Harun, Primary School Administrator)

Collaboration builds professionalism, relationships, and enhances the overall performance of the institution.
(Haida, Primary School Administrator)

We conducted a Virtual English Camp ... collaboration with other teachers or schools is quite refreshing ... you [can] see new ideas.
(Hafiz, Secondary School Teacher)

We collaborated with teachers from Sabah and Sarawak. I have never used TikTok but when I learned from them, I began TikTok-ing. I picked up on this quite fast and now I know how to utilise TikTok by learning from teachers from other states.
(Zubaidah, Secondary School Teacher)

One instance of digital learning agility characterised by collaborative practise is evident in one participant, as she mentioned that she did not have the best tool to conduct online teaching and learning activities, but she was able to do so during the pandemic.

I conducted a virtual camp with schools from three other districts. There were several challenges as I was also learning how to use Zoom and breakout rooms at that time, but I managed to conduct the camp successfully. These are the things that I think I have done during the movement control order which I initiated myself despite the limitations. My laptop is very basic and old, so I am proud of the fact that I can carry out all these things.
(Puteri, Secondary School Teacher)

These evidence and findings echoed Wang et al. (2023), Fullan (2008), and DuFour's (2006) view that collaboration fosters continuous improvement and creates a culture of shared learning that enhances both individual and organizational success. Idea exchange for professional development, as promoted by Yu and Chao (2023) was consistent among the participants in this study. Furthermore, collaboration serve as a driver for innovation, which aligned with DLA's emphasis on creating flexible and innovative approaches to address unique educational challenges. This is in congruent with Kools and Stoll (2016) who asserted that the ability to design virtual events, integrate novel tools, and reflect on practice demonstrates one's agility in navigating the complexities of digital education.

Conclusion

In the quest to answer the question on how collaborative teacher growth within the DLA affect their professional development, this study found three main themes that could furnish it. They are (i) acquisition of new skills and knowledge, (ii) peer support, mentorship, and resource sharing, and (iii) innovation, reflection, and institutional growth. The findings from this study shed an insight on the pivotal role of collaboration in teacher professional development, particularly within the framework of DLA. The experiences of teachers in collaborative initiatives, including workshops, resource sharing, and innovative event organization, highlighted the significance of collaboration in tackling educational difficulties and enhancing teaching methods. These collaborative dynamics align with the ideas of Digital Learning Agility, which underscore adaptability, ongoing learning, and the proficient integration of digital resources in education. Through collaborative activities, educators not only acquire new knowledge but also enhance their ability to manage the intricacies of digital transition in education. This highlights the necessity for organised and supportive collaborative settings that enable educators to explore and implement digital technologies, so that it could enhance both the personal and institutional efficacy.

It is suggested for the teacher training programs and curriculum design to integrate structured opportunities for collaborative learning, mentorship, and peer support to facilitate the acquisition of new skills and knowledge. By embedding collaborative practices into professional development initiatives, educators can continuously refine their digital competencies, share innovative teaching strategies, and collectively navigate the ever evolving technological landscapes. Furthermore, fostering a culture of reflective practice and institutional growth through collaborative engagements can enhance not only individual teaching effectiveness but also overall school performance. These insights highlight the need for dynamic, practice-driven training models that emphasize teamwork, resource-sharing, and adaptability—critical components in preparing educators for the ever-changing demands of digital education. In conclusion, although the pandemic has caused several challenges to the teachers, in retrospect it has also transpired informal professional development that has benefited teachers who are collaborative and digitally agile.

Acknowledgements

This study is supported financially by the Fundamental Research Grant Scheme (FRGS) of the Malaysian Ministry of Higher Education (FRGS/1/2022/SSI07/UPM/02/1). The assistance of the Research Management Center (RMC) of Universiti Putra Malaysia in coordinating and distributing funds for this research is greatly appreciated.

References

- Braun, V. & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Campbell, S., Greenwood, M., Prior S., Shearer, T., Walkem, K., Young, S., Bywaters, S. & Walker, K. (2020). Purposive sampling: complex or simple? Research case examples. *Journal of Research in Nursing*, 25(8), 652-661. <https://doi:10.1177/1744987120927206>
- Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.

- Darling-Hammond, L., Hyster, M. E., & Gardner, M. (2017). *Effective Teacher Professional Development*. Learning Policy Institute.
- Derue, D. S., Ashford, S. J., & Myers, C. G. (2012). Learning agility: In search of conceptual clarity and theoretical grounding. *Industrial and Organizational Psychology*, 5, 258–279. <https://doi.org/https://psycnet.apa.org/doi/10.1111/j.1754-9434.2012.01444.x>
- DuFour, R. (2006). *Cultures built to last: The power of professional learning communities*. Solution Tree.
- Fullan, M. (2008). *The six secrets of change: What the best leaders do to help their organizations survive and thrive*. Jossey-Bass.
- Islam, A. Y. M. A., Mok, M. M. C., Gu, X., Spector, J. & Hai-Leng, C. (2019). ICT in higher education: An exploration of practices in Malaysian universities. *IEEE Access*, 7, 16892–16908. <https://doi.org/10.1109/ACCESS.2019.2895879>
- Khambari, M. N. M., Wong, S. L., Abdullah, K., Moses, P., & Hamzah, S. R. A. (2022). Identifying the dimensions of teachers' digital learning agility in the age of exponential technology use. *30th International Conference on Computers in Education*, 149–154. Asia-Pacific Society for Computers in Education (APSCE).
- Kools, M., & Stoll, L. (2016). *What makes a school a learning organisation?* OECD Education Working Papers, No. 137. OECD Publishing.
- Liu, Y., Zhao, L., & Su, Y. S. (2022). The impact of teacher competence in online teaching on perceived online learning outcomes during the COVID-19 outbreak: A moderated-mediation model of teacher resilience and age. *International journal of environmental research and public health*, 19(10), 6282. <https://doi.org/10.3390/ijerph19106282>
- Milner-Bolotin, M. (2018). Evidence-based research in STEM teacher education: From theory to practice. *Frontiers in Education*, 3(92), 1–9. <https://doi.org/10.3389/educ.2018.00092>
- Moscoviz, L., & Evans, D. K. (2022). Learning loss and student dropouts during the covid-19 pandemic: A review of the evidence two years after schools shut down. CGD Working Paper 609. Washington, DC: Center for Global Development. <https://www.cgdev.org/publication/learning-loss-and-student-dropouts-during-covid-19-pandemic-review-evidence-two-years>
- Pamon, E. Q., & Oco, R. M. (2024). Teachers' competence and learners' academic performance. *International Journal of Multidisciplinary Research and Analysis*, 7(03), 1375-1383. <https://doi.org/10.47191/ijmra/v7-i03-63>
- Salmerón Aroca, J. A., Moreno Abellán, P., & Martínez de Miguel López, S. (2023). Teachers' Professional Development and Intelligent Ways of Coping with It: A Systematic Review in Elementary and Middle School Education. *Journal of Intelligence*, 11(1), 1. <https://doi.org/10.3390/jintelligence11010001>
- Sulaiman, S., Shaifuddin, N., & Samsudin, A. Z. H. (2024). Navigating New Horizons: Challenges of Malaysian secondary school teachers in cultivating digital information literacy competencies. *Environment Behaviour Proceedings Journal*, 9(SI18), 89–95. <https://doi.org/10.21834/e-bpj.v9iSI18.5463>
- Vangrieken, K., Dochy, F., Raes, E., & Kyndt, E. (2015). Teacher collaboration: A systematic review. *Educational Research Review*, 15, 17–40. <https://doi.org/10.1016/j.edurev.2015.04.002>
- Wang, N. & An, B. G. (2023). Improving teachers' professional development through professional learning community: Voices from secondary school teachers at Malaysian

- Chinese independent schools. *Heliyon*, 9(6) e17515.
<https://doi.org/10.1016/j.heliyon.2023.e17515>
- Wohlfart, O. & Wagner, I. (2024) Longitudinal perspectives on technology acceptance: Teachers' integration of digital tools through the COVID-19 transition. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-024-12954-y>
- Yu, T. K., & Chao, C. M. (2023). Encouraging teacher participation in Professional Learning Communities: exploring the facilitating or restricting factors that influence collaborative activities. *Education and Information Technologies*, 28(5), 5779–5804. <https://doi.org/10.1007/s10639-022-11376-y>
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic Review of Research on Artificial Intelligence Applications in Higher Education – Where are the Educators? *International Journal of Educational Technology in Higher Education*, 16(39). <https://doi.org/10.1186/s41239-019-0171-0>